Using RxNav for drug analytics – How to interpret obsolete drug identifiers?

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Motivation

Developed by the National Library of Medicine, RxNorm was created to address the lack of standardization in drug names, and to make drug terminologies interoperable by integrating them into a reference system. The main use cases RxNorm was designed to support include electronic prescribing, drug information exchange, and mapping across drug vocabularies (e.g., for medication reconciliation purposes). With each monthly release, the content of RxNorm is updated to add drugs recently marketed and remove drugs that are no longer marketed. In practice, RxNorm identifiers for these drugs are marked obsolete and the corresponding identifiers from the National Drug Code (NDC) Directory are removed from RxNorm. Accordingly, the RxNav browser and the RxNorm API (https://rxnav.nlm.nih.gov/) primarily provide information about active drugs in the most recent release of RxNorm.

Analytics was not among the use cases RxNorm was initially designed to support. One specific issue here is that many drug identifiers recorded in clinical data warehouses may no longer be valid in the current release of RxNorm and detailed information about the corresponding drugs may be missing. To address this issue, we have developed specific API functions to support a history mechanism for NDC and RxNorm identifiers.

History mechanism for NDC identifiers

The NDC identifier "0006-0963-58" corresponds to the branded drug *Pepcid* (famotidine) in tablets of 20 mg, manufactured by the company Merck Sharp & Dohme (Australia) Pty Ltd. in bottles of 100 tablets. According to its archived drug label, this drug was marketed between 10/15/1986 and 11/19/2013. While this drug is still on the U.S. market, it is no longer produced by this manufacturer with this specific packaging. This NDC identifier is now obsolete and is no longer present in the recent releases of RxNorm. However, this NDC identifier can be found in prescription databases, such as Medicare Part D data. For example, in our 20% random sample of Medicare Part D data (2006-15), the total number of prescriptions with this NDC is 1726. The earliest prescription is from January 2006 and the last one is from May 2013.

Two functions of the RxNorm API (and the corresponding features of RxNav) support the interpretation of obsolete NDCs.

- *getNDCStatus* returns information about obsolete (and active) NDCs. For "0006-0963-58", the function returns the current drug it corresponds to 104094 (*Pepcid 20 MG Oral Tablet*), as well as the dates it was found in RxNorm (June 2007 to Dec. 2014).

- *getAllHistoricalNDCs* returns all the NDCs, active and obsolete, ever associated with an RxNorm identifier. The NDCs returned for 104094 include "0006-0963-58".

History mechanism for RxNorm identifiers

Because they only encode information about the drug (and not manufacturer or packaging), RxNorm identifiers are far more stable than NDCs. However, when drugs are recorded using RxNorm identifiers in clinical data warehouses, some identifiers become obsolete over time. For example, RxNorm identifier 853056 (*Amoxicillin 40 MG/ML / Clavulanate 5.7 MG/ML Oral Suspension [Amoclan]*) is now obsolete. The current version of RxNorm only contains minimal information about obsolete drugs.

We developed the *RxCUI History API* to address this issue and help users interpret obsolete RxNorm identifiers. For 853056, in addition to the drug name, this API returns information, such as the definitional characteristics of the drug (list of ingredients and strengths, dose form, quantity factor and quality distinction), as well as metadata, such as the first and last versions of RxNorm in which the drug was active. RxNav now also provides information for obsolete RxNorm identifiers.